# DO102X* Series Dissolved $O_2$ Monitor/Controller

**User Manual**

***Note: Software functionality covers 1020-1022 & 1024-1026 variants**

http://www.ohdesigns.co.uk
contact@ohdesigns.co.uk

O&H Designs
35 Barton Rd
Barlestone
Warwickshire
CV13 0ER
England
Tel 01455 290 620

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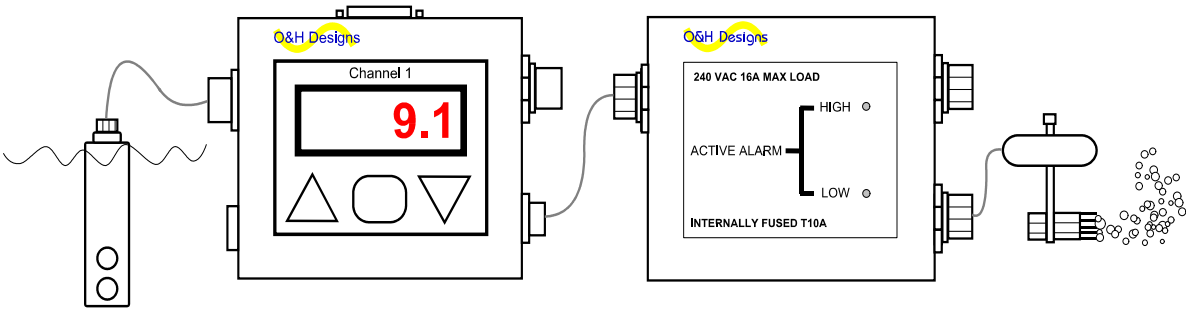
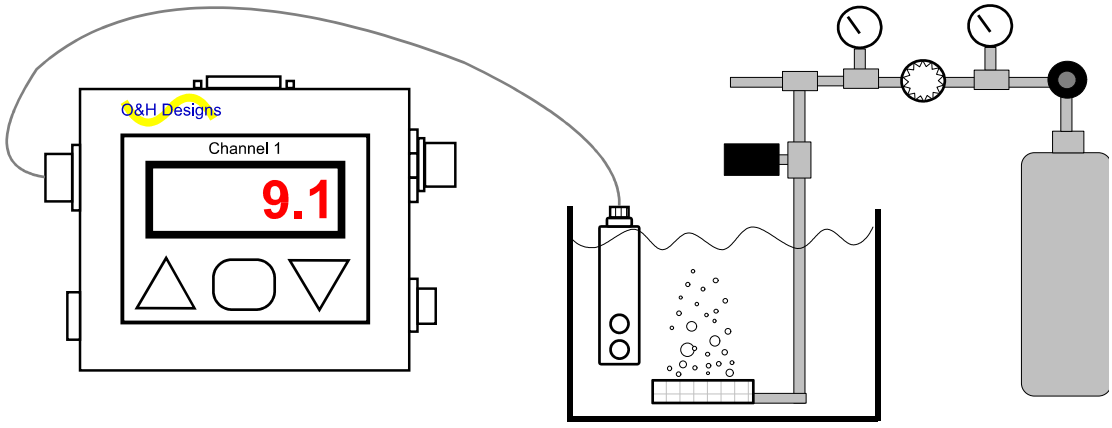
## 1. Introduction

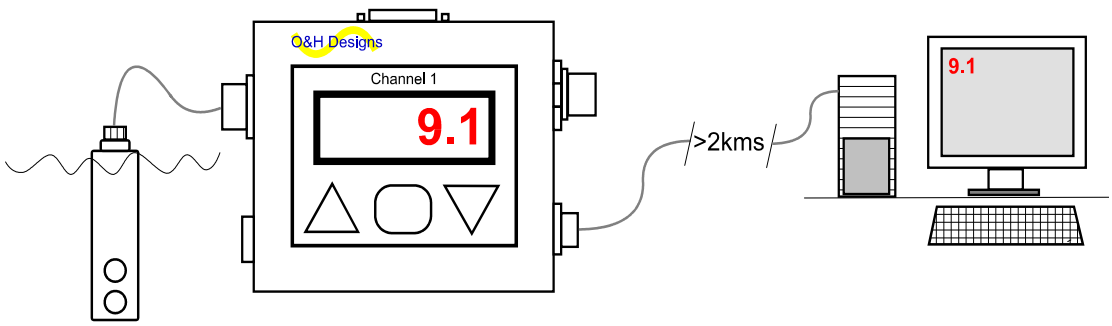
The DO102X series are advanced microprocessor controlled Dissolved Oxygen monitors. They will provide long periods of unattended service and can be used in monitoring or control applications. Typical set-up for single channel versions is shown below.




Measuring Dissolved Oxygen levels in tanks, ponds and lakes and turning on the installed aeration system when it's actually required thus saving energy.




The system can also be used to control $DO_2$ in both static and transportation tanks.




Static monitoring of $DO_2$ with remote link with up to 24 DO102X connected.

## 2. Safety

The manufacturer has designed this product to be safe when operated correctly.

Please take care to read any safety instructions as these have been designed to protect the user from personal injury and the equipment from damage.

**O&H Designs are not responsible for errors in usage or connection and accept no responsibility for consequential losses.**

## 3. Electrical Safety

The DO102X should be installed by a qualified electrician familiar with IEEE ed. 18th regulations or VDE. Users should be fully trained in safe operational conditions of mains based equipment.

12/24VDC versions can be installed with minimal electrical training.

Note that all IP integrity ratings quoted are when the DO102X units are screwed together and all mating seals are compressed. O&H Designs accepts no responsibility for personal injury or equipment failure due to water ingress as a result of poor installation.

## 4. Mounting

The DO102X can be used as a standalone system and installed both indoors or outdoors using customer preferred mountings.

Alternatively, the DO102X series is designed to be mounted to a 65mm OD pole or with appropriate fixings to a wall using the 'option B' kit.

For remote applications, the 'option A' system can be connected to a P.C up to 2 kms distance via RS485. The display & power switch can therefore be mounted near to the probe and remote readings can be obtained and logged onto a computer.

When monitoring Oxygen levels in transportation tanks, ensure that the probes are continually immersed during use. Do not position the probe direct over the Oxygen diffusers. The same rule applies to aerators.

## 5. Specifications

Conformity..... EN61010, EN61326-1, 97/23/EC CE marked

### Environmental

Temperature (Electronics)..... -10°to 40°C
Storage..... -20° to 50°C
Sealing..... IP65

Weight (approximate)...DO102X..... 450gms
Weight (approximate)...DO1024..... 1100gms

**Dimensions** DO1020
Width..... 100 mm
Height..... 60mm
Depth..... 100mm

**Dimensions** DO1024
Width..... 213 mm
Height..... 119 mm
Depth..... 185 mm

**Power supply**
Mains (factory set)..... 110/230 VAC
Power consumption..... 2 watts
Low voltage option (factory set)..... 12-24 VDC

**Battery Versions**
NimH internal battery..... 7.2VDC
Consumption..... 1.4 watts
Battery life at 20°C .....7 hours

**Measurement parameters**
Probe type.....Sealed Galvanic
Probe lead length (max)..... 25m
Probe operating temperature range ..... 0° to 40°C
$DO_2$ range ..... 0 to 40mg/l
$DO_2$accuracy (instrument minus probe)..... 3% rdg ±0.1mg/l
$DO_2$display resolution ..... 0.1mg/l
Maximum Probe Depth..... 2.5 mtrs

## 6. Abbreviations

Note: Abbreviations are the same in singular or plural.

| | | | |
|---|---|---|---|
| $DO_2$ | Dissolved Oxygen | LED | LightEmtting Diode |
| AC | Alternating Current | DC | Direct Current |
| RTD | Resistive Temperature Device | mg/l | milligrams per litre |
| °C | Degrees Celsius | P.C | Personal Computer |
| Kms | Kilometers | IP | Ingress Protection |
| gms | grammes | KCL | Potassium Chloride |
| mm/Hg | millimeters of mercury | mb | millibar |

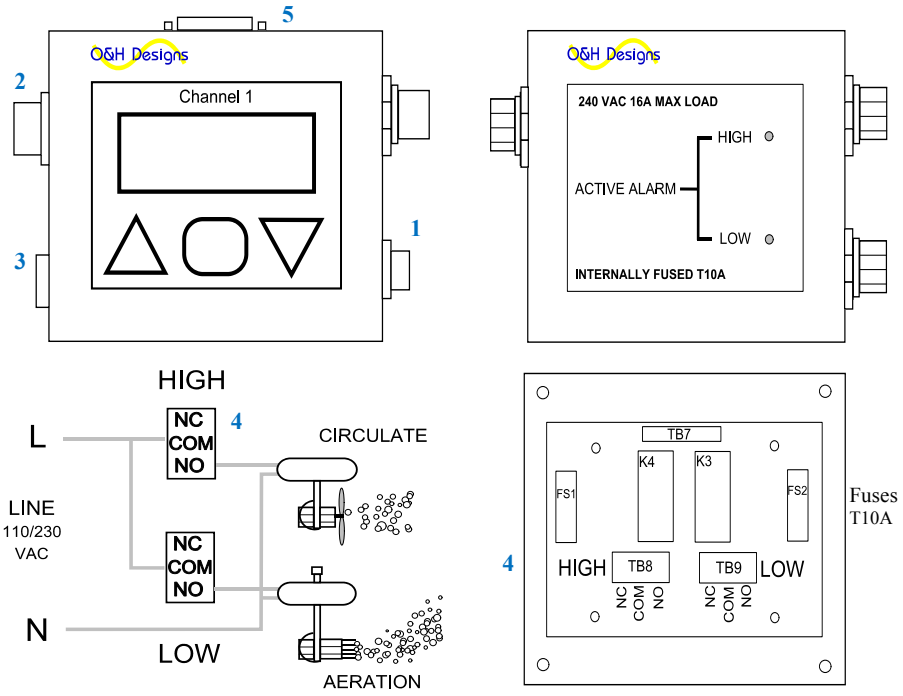
## *7.* Initial Usage - *D01020*

When connecting the DO1020 to the power source, observe the input voltage setting for either 110VAC, 230VAC or 12-24VDC. Observe the fuse rating for the unit of T500mA 20mm size [3].

If supplied, connect the power switch or $O_2$ control valve to the 5 pin connector [1] on the side of the DO1020.

Connect the $DO_2$ probe to the 6 way connectors [2] on the side of the DO1020. Connection [5] is only fitted with option 'A' RS485.

Remove the cover from the power switch and connect the mains device to the relevant output via the terminal blocks [4] High or Low.




When the unit is powered up allow at least 5 minutes for stabilisation.

## *8.* Initial Usage - *DO1021, 22, 24 & 26*

Connect the $DO_2$ probes to the 6 way connectors on the bottom of the unit. Ensure these are only finger tight.

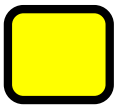
If a valve control system is used, connect to the 8 way control socket and 2 way valve power using the supplied cables.

If fitted, fuse ratings are T2A 20mm size for fuses on the display boxes. Cigar style plugs have an integral 8A automotive cartridge fuse.

If charging is required, connect the charger port via the Cigar style connector or charge via the supplied mains charger for 12-14 hours.

Pressing the power switch will turn the unit on and the system will go through a self test.

The default display units are now shown in mg/l of $DO_2$.

Pressing the  key will give a probe temperature reading in °C

This will remain on the display for 5 seconds then revert back to $DO_2$

## 9. Probe Placement

Ensure that the clear protective sealing cap is removed prior to deployment.

During operation, place the probe in a vertical position with the probe tip facing downwards. This is indicated on the side of the Probe housing. When positioning the probe in the water to be monitored. Take care to locate away from the direct influence of aerators/Oxygen diffusers.

Actual position when immersed is dependant on depth profile, width and length, therefore actual placement postion will be found by 'in-situ' testing. When a new probe has been installed, allow 30 mins before calibration.

## 10. Calibration

All DO102X systems are supplied with a default calibration at 100% water saturated air at 1013mb pressure. All normal readings are in mg/l.

It is recommended that the sensor is recalibrated at regular intervals. This is dependant upon the suspended solids and build up of algal growth during that period.

In areas of hardwater, check for calcification deposits around the probe tip. It's recommended that water is removed from the probe tip after use.

Regular checks are necessary. Use a soft brush or moistened tissue to remove buildup from the probe tip.

The probe is a sealed Galvanic type and thus requires no KCL solution for filling. Life expectancy in normal use is approx 30 months.

**DO NOT:**

*Direct high-pressure water jets onto the probe tip as this could damage the membrane.*

*Use abrasive wipes on the probe membrane.*

*Clean the probe with chemicals such as Isopropyl Alcohol.*

*Allow contact with the membrane whilst calibrating the 100% point.*

*Take readings directly after immersion in water. Allow at least 10 mins for the $DO^2$ probe tip and internal compensation electronics to stabilise.*

**DO:**

*Use clean de-ionised water to clean probe tip. Use of a soft brush is advised.*

*Position the probe in a vertical position during calibration.*

*Allow 10 mins before calibration to allow the $DO_2$ probe to reach equilibrium with ambient conditions.*

*Replace the protective cap half filled with de-ionised water. This is only required if stored for long periods.*

*Allow for probe errors in completely static water which may be up to 0.5mg/l, this is normally accounted for when setting high or low alarms.*

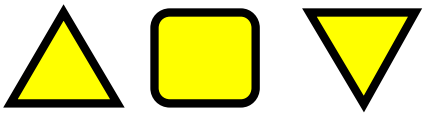
*Dry any excess water from the probe tip before calibration. Use of a soft tissue is advised.*

## 11. Method

Calibration should be carried out in a temperature range of 15-25°C

The zero 0% point is extremely stable and factory set, it therefore requires no calibration adjustment. The following method details calibration for the *100% point.

Enter the calibration menu by pressing the following keys together for 3 seconds:

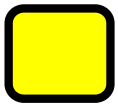


***Quick Cal: You can also get to the $DO_2$ calibration by holding the middle key down for 5 seconds***

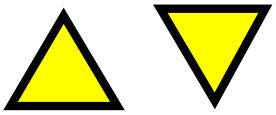
The calibration menu will now be available:

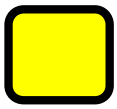
**DO2 SAL PrES rtd TC End**

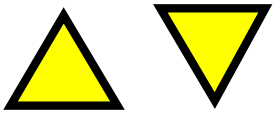
Use the keys to scroll through the menu

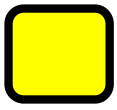
Select DO2  **DO2** SAL PrES rtd TC End

**The *100% calibration point is now shown.**

Use the keys  to adjust between **95-105%**

Press the key  when the reading is stable to accept calibration

To quit, use  to select DO2 SAL PrES rtd TC **End**

Press the key  to quit

The display will now read the calibrated value in mg/l.

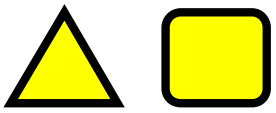
*** Usually calibrate at 105% to allow for localised $O_2$ consumption**

## 12. Setting Upper and Lower alarm

**Note: the alarm levels are set to 0 on the DO1021**

The upper setting is normally used for circulators when high oxygen levels are present. High output circuitry is fitted on request.

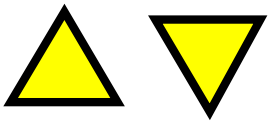
Lower outputs set the lower limits to either sound an alarm or turn on aeration or oxygenation.

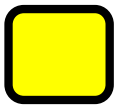
Hold the keys  for 1 second to select **HIGH** setting

The display will flash **HI**

Hold the keys for 1 second to select **LOW** setting

The display will flash **LO**

Use the keys  to adjust high or low settings.

Press the key  to accept the high or low alarm point.

The display will flash **dOnE**

The display shall now show the normal reading

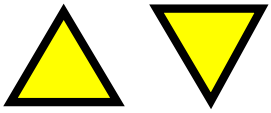
When either the High or Low alarms are exceeded, the display will flash and the appropriate power switch or valve connected will operate until the readings return to a normal level.

## 13. Minimum & Maximum readings

The minimun & maximum feature allows upper & lower trends in readings to be recorded. This can be usefull for collecting $DO_2$ data. E.g collection of upper & lower $DO_2$ readings during fish transportaion or capturing diurnal variations in lakes & ponds.

Press the key to display the minimum reading since reset.

Press the key to display the maximum reading since reset.

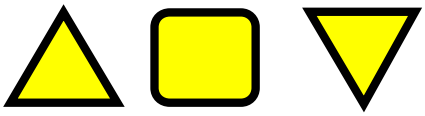
To reset, press  High & Low will now be reset.

The display will flash **rSt**

## 14. Setting Atmospheric Pressure

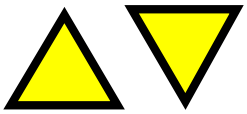
If large swings in atmospheric pressure occur due to either altitude or weather variations, readings can be corrected for maximum accuracy. Table 1 (pg11) illustrates the relative corrections that can be applied.

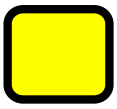
Enter the calibration menu by pressing the following keys together for 3 seconds:



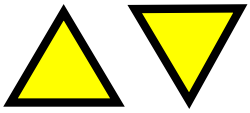
The calibration menu will now be available:

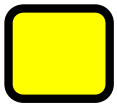
DO2 SAL PrES rtd TC End

Use the keys  to scroll through the menu

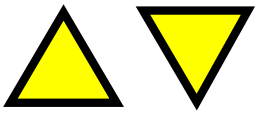
Select **PrES**  DO2 SAL **PrES** rtd TC End

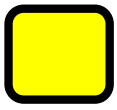
**The display will show the default of 760 mm/Hg**

Use the keys  to adjust if required

Press the key  to accept the pressure reading

The display will flash **dOnE**

Use the keys  to select **End**

Press the key  to quit to normal reading

The effects of adjustment of pressure are shown below. The DO102X will apply the relevant correction factors.

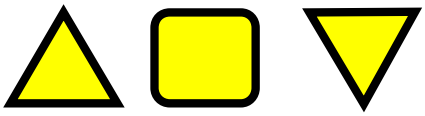
***Table 1***

| (m)height | Pressure (mmHg) | Factor |
|---|---|---|
| 0 | 760 | 1 |
| 100 | 750 | 1.01 |
| 200 | 741 | 1.03 |
| 300 | 732 | 1.04 |
| 400 | 723 | 1.05 |
| 500 | 714 | 1.06 |

## 15. Setting Salinity

If the instrument is usaed in brackish or seawater then a salinity correction factor can be applied to obtain maximum accuracy.
Table 2 (pg12) illustrates the relative corrections that can be applied

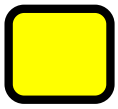
Enter the calibration menu by pressing the following keys together for 3 seconds:



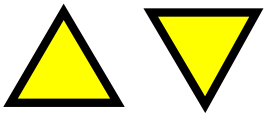
The calibration menu will now be available

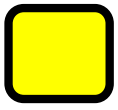
DO2 SAL PrES rtd TC End

Use the keys to scroll through the menu.

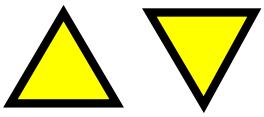
Select **SaL**  DO2 **SAL** PrES rtd TC End

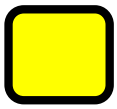
**The display will show the default of 0 parts per thousand(ppt)**

Use the keys  to adjust if required.

Press the key  to accept the salinity reading.

The display will flash **dOnE**

Use the keys  to select **End**.

Press the key  to quit to normal reading

The table below shows the effects of salinity on the readings and the factor the DO102X will appply.

***Table 2***

| Salinity ppt | Factor |
|---|---|
| 0 | 1 |
| 5 | 0.97 |
| 10 | 0.94 |
| 15 | 0.91 |
| 20 | 0.88 |
| 25 | 0.85 |
| 30 | 0.83 |
| 35 | 0.8 |

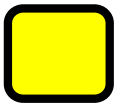
## 16. Platinum Resistance probe

**The platinum resistance probe (RTD) provides an accurate temperature reading used for correcting for $DO_2$ probe variations.**

This is shown as rtd in the calibration menu.

DO2 SAL PrES **rtd** TC End

This reading is normally factory calibrated and should not require re-calibration during normal service life of the probe. Contact O&H Designs for details of re-calibration

Pressing the  key will give a probe temperature reading in °C

This will remain on the display for 5 seconds then revert back to $DO_2$

## 17. Probe Temperature Coefficent

This is shown as TC in the calibration menu.

DO2 SAL PrES rtd **TC** End

**Do not** adjust this value as the probe will display incorrect readings at differing temperatures. Defaults values are typically -1.6.

The reading is factory calibrated and should not require re-calibration during normal service life of the probe. Contact O&H Designs for details of re-calibration

## 18. Service & Warranty

For more information on the DO102X, contact us directly or an approved agent.

O&H Guarantees the unit to be free of defects for a period of 12 months from date of manufacture.

This does not cover damage to the probe tip caused by unreasonable use.

This warranty excludes incidental or consequential damages arising from the use of this product

O&H Designs provides a service capability for their products. Replacement probes and other spare parts are available direct.

O&H Designs also offers a recalibration service for all environmental parameters. This can be on any interval as required by the customer.

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http://www.ohdesigns.co.uk
contact@ohdesigns.co.uk

O&H Designs
35 Barton Rd
Barlestone
Warwickshire
CV13 0ER
England
Tel 01455 290 620